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Honduras

Biofuels

Annual Report

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Report Highlights: Honduras' growing demand for fuel and the increase in production of African palm oil result in expanded opportunities for biofuel development. The production of African palm oil has become more efficient leading to increased output and more land planted to African palm trees. Honduras has ten African palm oil extracting plants, five of which produce biodiesel for their own consumption. Honduras is the only Central America country that has approved laws for both biodiesel and ethanol production. These laws provide exemptions from customs tariffs, income tax, and other related taxes for 12 years.

Includes PSD Changes: No

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Annual Report

Tegucigalpa [HO1]

[HO]

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Executive Summary

Honduras' growing demand for fuel provides an excellent opportunity to develop biofuels. Honduras imported five million barrels of diesel in 2007. This amount accounts for 26 percent of the 19.4 million barrels of fuel imported that year, and an eight percent increase from 2006.

To meet fuel demands, Honduras is developing and supplying biofuels. The country provides excellent conditions for the production of African palm oil production, and in the last six years such production has increased by 100 percent. In 2006, the Honduran Ministry of Agriculture and Livestock identified an additional 440,000 hectares of land suitable for potential expansion of African palm. In 2007 African palm oil production reached 300,000 metric tons of oil and land given to the cultivation of African palm accounted for 100,000 hectare.

Currently, Honduras has ten African palm oil extracting plants. Five of those plants, produce biodiesel at 10 percent of their capacity, and the biodiesel is used mostly for local consumption. These five plants can potentially produce 60,100 gallons of biodiesel per year.

The Honduran Government's (GOH) legal framework is also well suited for the development of biofuels. Honduras is the only Central American country that has approved a law that treats biodiesel and ethanol production equally. The law provides a mechanism to define the mix of biodiesel with diesel, and of ethanol with gasoline. The law also provides exemptions from customs tariffs, income tax, and other related taxes for 12 years.

The private sector, non-governmental organizations (NGOs), and international organizations have developed innovative approaches for making biodiesel from African palm oil and *Jatropha curcas*. Additionally, new initiatives in the production of biofuels have been established such as the production of biodiesel from tilapia by-products, the production of biogas sold for carbon credits, and the production of biomass to burn for electricity. To support biofuel development, Honduras has two university centers. The Pan American School of Agriculture (Zamorano) has a "Center for Scientific Support for the Production of Renewable Energy." Honduras also has four international airports, three of them located in the north of the country where the African palm is grown and exported. The cost of biodiesel production in Honduras is affected by the price of African palm oil and fuel. As the GOH takes away some of its fuel subsidies, consumer prices will rise. Subsequently, the incentive to use and produce biodiesel will increase.

Production

Honduras provides favorable geographic and climatic conditions for the production of biodiesel. The African palm plant is currently the primary source of biodiesel in Honduras. In its 2006 "Register of Characterization and Geo-Referencing of the Members the African Palm Agri-Food Chain," the Ministry of Agriculture and Livestock (SAG) observed that African palm production can expand an additional 440,000 hectares (ha). Currently 100,000 ha are under cultivation. Another plant which is capable of producing biodiesel is *Jatropha curcas*. Honduras has 5,000 ha planted to *jatropha* and many national and international organizations are attempting to increase its production.

Honduras is using many innovative approaches to obtain biodiesel as described in the Marketing/International Cooperation Section.

The chart below shows products used to produce biofuels.

Quantity of Feedstock Use in Biofuel Production in Honduras (Metric Tons)						
		2003	2004	2005	2006	2007
Biodiesel						
Vegetable Oil						
	Palm oil	27,000	30,000	33,330	41,325	45,000
	Fish oil	0	0	0	N/A	N/A
	Jatropha oil	0	0	0	0	0
	Other (biogas)	0	0	0	0	N/A
Ethanol						
	Sugarcane	0	0	0	0	0

Biodiesel Production

a) Biodiesel from African Palm

African palm production in Honduras began commercially in 1971. As part of the agrarian reform, producers organized into agro-industrial enterprises. One of their objectives was to expand the production of African palm in the regions of Cortés, Atlántida, Yoro and Colón, all at the north Atlantic coast. In 2005, the GOH implemented an investment plan for African palm which established the Register of Characterization and Geo-Referencing. This Register included the elaboration of the location of the African palm sector. It has an interactive database that links together socioeconomic factors, production, and the location of the plants (extracting, fractioning, and refining).

The Register (an extract of which is below) indicates the size, number of productive units, and hectares owned in the African palm sector.

Scale of African Palm Production

Description	Area (ha)	Number of Productive Units*	Percentage of Productive Units	Total Area (ha)	Percent of Area
Small	< = 10	1,485	63	6,799	8
Medium	10.01 - 100	773	33	21,386	24
Large	100.01 – 1,000	106	4	24,820	28
Large companies	> 1,000	7	<1	36,095	40
Total		2,371		89,100	

* A productive unit is an individual farm that has at least one hectare of land planted to African palm.

Source: National Agrifood Program (PRONAGRO), Ministry of Agriculture and Livestock

The national average yield of African palm fruit is 17.11 metric tons (MT)/ha/year. Yield is affected by the diversity of micro-climates, soil types, genetic varieties of the African palms, pests, and the availability of credit to buy fertilizer. Irrigation is another factor that

influences yield. The average cost to install irrigation is US\$640 per hectare making it too expensive for small producers. Most producers use pesticides to control weeds.

Yield in the processing stage is affected by the quality of fruit. Fruit which is harvested green will likely be damaged during transportation. Additionally, the state of the plant and the equipment influences the yield.

Another factor in African palm management is that the average age of the plantations is about 14 years, meaning that significant replanting is needed. Labor is also becoming scarce since young people move away from the rural areas to take jobs at higher salaries in the cities.

Since 2000, demand for African palm oil has been growing. The chart below shows that over a seven-year period, production increased by more than 100 percent to 1.4 million MT. The chart also shows that planted area increased from 62,000 ha to 100,000 ha, up 61 percent. Oil production increased 115 percent and exports increased 500 percent.

African Palm and Oil Production

Year	Hectares	Production Fresh Fruit (MT)	Production Oil (MT)	Oil Exports
2000	62,000	665,000	139,650	32,939
2001	65,000	735,000	154,350	36,000
2002	68,000	813,000	162,600	50,000
2003	73,000	900,000	180,000	54,000
2004	78,000	1,000,000	200,000	80,000
2005	82,100	1,111,000	222,200	120,000
2006	89,200	1,311,500	275,500	170,000
2007	100,000	1,400,000	300,000	200,000

Source: PRONAGRO, Ministry of Agriculture and Livestock

Of the 300,000 MT of African palm oil produced, 85 percent is used to produce oil and 15 percent is used for biodiesel production. Of the 200,000 MT of palm oil exported, 60-70 percent is exported to Mexico and 20-30 percent is exported to El Salvador. Any residual amount is exported to Nicaragua and Guatemala. Mexico is eager to buy three times its current imports.

The GOH made an agreement with Malaysia to import one million Malaysian palm seeds. The seeds arrived, were planted, and will eventually cover 28,000 ha. These seeds have greater yield potential and shorter maturation than the African palm seeds. Large green houses have been built to support this planting program.

There are ten oil extraction plants that are owned by four export companies. The plants listed below have the ability to extract, refine, fraction, and make processed oil products (margarine, lard, cooking oil, and snacks). These plants produce biodiesel for their company's vehicles, machinery and irrigation pumps. On an average, it takes 4.76 MT of fresh fruit to produce one MT of oil (at an extraction rate of 21 percent). The processing capacity of these plants is 60,100 gallons (2.952 million liters) of biodiesel per year. These plants are currently producing at 10 percent of their processing capacity.

	Oil Extraction Plants	Capacity (Gallons)
1	Dinant	30,000
2	Jaremar	25,000
3	Salama	2,800
4	Hondupalma	1,500
5	Coapalma	800
	T O T A L	60,100

Source: PRONAGRO, Ministry of Agriculture and Livestock

Dinant Corporation is one of the leaders in African palm production. The corporation manages 19,000 ha of land. It also contracts with independent producers to plant and manage an additional 4,000 ha. Fifty percent of its oil production is exported. Dinant uses the remaining oil to produce processed oil products.

In 2005 the Dinant Corporation began operation of a biodiesel processing plant. It used biodiesel (B100 – a classification of biodiesel) to fuel its distribution trucks and six public transportation buses in Tegucigalpa. The only modification it made to its vehicles was to change the filters. The processing plant was then enlarged for a capacity of 36,000 gallons of biodiesel (B100) per day, enough to run a fleet of diesel trucks, tractors, equipment for irrigation, other vehicles, retro-excavators, and a bulldozer.

b) Biodiesel from Jatropha Curcas

The land and climate in Honduras are highly suitable for the growth and production of jatropha curcas. This tree-like plant grows in marginal soils and has limited requirement for water. The plant bears fruit twice a year for 25 productive years, but needs extensive labor. During the first year, the plant may provide 10 percent of its potential oil yield and the percentage continues to increase until it is mature. At maturity (six years), jatropha can provide 1,500 liters of oil per hectare. Since Jatropha grows on poor quality soils, it does not compete with land for food production. In 2008, the GOH met its goal of planting 1,000 hectares of jatropha. The goal for 2009 is to plant an additional 2,000 hectares. Investment is needed for the producers to grow Jatropha. Honduras has the know-how, but, producers need financing to manage a plantation and earn a living during the three years it takes the plants to reach maturity.

c) Biofuel from By-Products

There are three innovative biofuel projects being developed in Honduras. One relates to biodiesel obtained from the processing of tilapia, and the others involve using by-products of African palm oil for the production of biogas and biomass.

By-Product from Fish Processing (biodiesel)

AquaFINCA Saint Peter Fisheries is the largest tilapia farm in Honduras, producing 32,850 MT of fresh fish every year. In 2006, AquaFINCA opened a biodiesel plant which uses tilapia waste. The fish remnants (guts, heads, skins, and internal organs) are rendered into oil which is processed into biodiesel as a fuel stock. AquaFINCA produces 300,000 gallons (1.135 million liters) of biodiesel annually and uses it to run the company's vehicles. This biodiesel replaces 60,000 gallons per month of petroleum fuel. AquaFINCA was awarded the Latin American Award of the Environment in 2006.

By-Product of Palm Oil Extraction (biogas)

EECOPLASA, a private Honduran company, uses the liquid waste from its African palm oil extracting plant (PALCASA) to produce energy. The liquid waste obtained from washing down the oil extraction equipment is stored in a covered lagoon where it decomposes and creates biogas (65 percent methane and 30 percent CO₂). The biogas is captured and burned to create 1.266 mega watts per hour (Mw-h) of electricity. The biogas is sold for US\$21.00 per metric ton as carbon credit certificates every year at to the Swiss government.

EECOPLASA is the first African palm biogas project in the world certified for carbon credits. This company is planning to expand to 11,000 cubic meters of biogas to produce 950 kilowatts per hour (Kw-h). This expansion will increase its production of energy from biogas to 2.216 Mw-h.

By-Product of Solid Waste from Palm Oil (biomass)

EECOPLASA has also developed the technology of boiling the solid waste (biomass) of the African palm to produce electricity. Three MT of African palm fruit produce one MT of biomass. Approximately 3.5 metric tons of biomass can produce 3.5 mega watts of electricity per hour.

Ethanol Production

Currently there is no commercial ethanol production in Honduras. The sugar mills produce the energy they use during the harvest months through the use of bagasse (the biomass remaining after sugarcane stalks are crushed to extract their juice). The mills can generate 128 Mw-h, with a potential of 344 Mw-h of electricity. They also sell electricity to the GOH's electric company ENEE. Due to the high price of oil, one of the mills will begin using 30,000 MT of coal during the non-harvest season of May-November, and other mills may do the same.

Consumption

a) Biodiesel Consumption

Currently, there is no commercial biodiesel consumption in Honduras. There are five African palm oil processing plants and one tilapia by-product processing plant that utilize their

internally produced biodiesel. The biodiesel powers irrigation equipment and company vehicles. The biodiesel production and consumption is shown below:

Biofuel production/consumption/trade (million liters)					
	2003	2004	2005	2006	2007
Biodiesel/ethanol					
Beginning stocks	N/A	N/A	N/A	N/A	N/A
Production*	N/A	N/A	N/A	N/A	4,087
Imports	N/A	N/A	N/A	N/A	0
Total supply*	N/A	N/A	N/A	N/A	4,087
Exports	N/A	N/A	N/A	N/A	0
Consumption	N/A	N/A	N/A	N/A	4,087
Ending stocks*	N/A	N/A	N/A	N/A	0

Note: The five African palm oil extracting plants produce 60,000 gallons (2,952 liters).
 Aquafinca produces 1,135 million liters

*The biodiesel production is not for commercial purposes.

b) Ethanol Consumption

Currently there is no commercial ethanol consumption in Honduras.

Trade

Under the Central American-Dominican Republic Free Trade Agreement (CAFTA-DR) with the United States, there are opportunities for ethanol production. The participating countries have duty-free access to export to the United States the ethanol produced from regional feedstock. CAFTA-DR quotas are equal to seven percent of U.S. ethanol consumption. If consumption increases in the United States, the quota can also increase.

Stocks

Currently there are no commercial stocks of biofuels in Honduras.

Policy

Honduras is the only Central American country that has a Biofuels Law. The GOH created "The Law for the Production and Consumption of Biofuels" in November 2007. Three GOH Ministries worked on the design and implementation of policies for the production of biofuels and their promotion in the market. The participating Ministries are: the Ministry of Industry and Trade (SIC), the Ministry of Agriculture and Livestock (SAG), the Ministry of Natural Resources (SERNA).

SIC oversees the promotion, commercialization, distribution, and storage of biodiesel. To accomplish these tasks, SIC created the Technical Unit of Biodiesel (UTB). The UTB is integrated by representatives of SAG, SERNA and a representative of the Honduran Council of Private Enterprise (COHEP). SAG applies the law to promote research and the production of sustainable feedstock for the generation of biodiesel. Programs are implemented through incentives, promotions, and credits. As an example, SAG has purchased improved African palm seeds from the Malaysian government.

The Biofuels Law provides funds to promote the production and transformation of feedstock to biodiesel. These funds can be used for the purchase of equipment, materials, and services used for the planting, design, installation, construction, and operation of projects. The funds are exempt from customs tariffs, income tax, and other related taxes for 12 years. These incentives are available for businesses using at least 51 percent of the feedstock of Honduran origin.

The law provides for the creation of a regulation and mechanism to define the mix of biodiesel with diesel and ethanol with gasoline. The regulation is drafted and it is expected to be approved by the end of 2008. The mechanism will be based on supply and demand analysis. Producers of sugarcane and African palm, and the processors of ethanol and biodiesel will provide their production capacity to the UTB for a six-month period. Based on the supply and demand of biodiesel and ethanol, the UTB will set the mix at two, three or five percent. The main obstacle for the industry is deciding what is more profitable: to sell the oil for food and other types of processing, or to make biodiesel. The private sector is eager to take advantage of the law. The UTB is currently holding meetings with car importers encouraging them to import flex cars using hydrated alcohol of 1800 cubic centimeters.

The Honduran Sugar Producers Association (APAH) advocated for the design and approval of the Biofuels Law. APAH saw this law as key for investment in ethanol production. Through their investment plans, APAH completed a feasibility study of the infrastructure and funding requirements to build an ethanol processing plant. The cost would be about US\$40 million if the plant were installed in an existing sugar mill. If a new sugar mill with an ethanol processing plant were built, the cost would be between US\$170 and 200 million. The sugar mills are waiting for the approval of the regulation that will set the mix.

The GOH believes that biodiesel will bring an increase in employment and incomes in the rural areas. For example, it is calculated that one hectare of African palm can produce 1,000 gallons of African palm oil. Each hectare can create 1.5 direct jobs and 2 indirect jobs. If 1,000 hectares are planted and two percent biodiesel is added to diesel, 1,500 direct jobs and 2,000 indirect jobs could be created.

Marketing/International Cooperation Approach

Honduras/United States:

Through a United States/Brazil/Honduran investment of US\$60 million, Honduras will install an ethanol dehydration plant. The plant will use ethanol imported from Brazil. Ninety-five percent of the production will be exported to the United States duty free under the CAFTA-DR agreement. Five percent will be used for domestic consumption, which is allowed by the "Industrial Zones for Processing for Exportation" law. The plant will process 100 million gallons of hydrated ethanol per year.

Honduras was chosen as part of the second tranche of the United States/Brazil Biofuels Initiative. Under this initiative, potential investment opportunities will be identified.

Technoserve, a United States Private Voluntary Organization (PVO), is conducting a Jatropha diversification program. This program helps individual producers establish integrated farms that combine jatropha with dairy, cocoa or roots, and tuber production. By establishing four model farms (demonstration farms), Technoserve will build partnerships to study plant yields and management. Technoserve will also develop, and distribute a jatropha production manual adapted to Honduran conditions.

Honduras/Europe:

The German Development Service (DED) conducted a six-month experiment with biodiesel in 2007. The experiment featured six public transportation buses powered by biodiesel made from African palm. Through partnerships between investors and producers, DED is transforming bus motors so they can use jatropha biodiesel. The cost to transform a 35 passenger bus is between US\$1,500 to \$2,500. A jatropha processing plant is under construction.

The Dinant Corporation is applying its African palm/biodiesel technology to the *Jatropha curcas* plant. This venture is being developed with assistance from the Netherlands Development Organization (SNV) and the Honduran Enterprise Counsel of Sustainable Development (CEHDES). Program funds are provided to small producers of jatropha through a five year credit. The program is reaching 950 families from multiple ethnic groups. The producers receive technical assistance to develop a business model for production. The program will last two years and will result in about 4,000 hectares planted in jatropha. It is expected that by the year 2010, the production of *Jatropha* will reach 2,700 metric tons, and from which approximately 250,000 gallons of biodiesel will be produced.

Another jatropha project is being carried out by the Honduran NGO Foundation for the Agribusiness Rural Development (FUNDER). This project, "Green Drop," is sponsored by six European organizations and the Honduran Research Foundation (FHIA). They are providing technical assistance to small producers on the selection of growing areas, growing techniques, motor adaptation, and commercialization of biodiesel. The objective of the project is to diversify production, create employment, increase income, reduce CO2 emissions, and promote the use of biodiesel.

Honduras/Central America:

A regional forum on Bio-energy, Natural Resources, and Energy Efficiency in Central America took place in Honduras in October 2008. This forum was sponsored by the Central American Bank of Economic Integration (BCIE).

Honduras/Colombia:

The Colombian government, through an agreement with the GOH, donated a biodiesel plant with a daily production capacity of 10,000 liters. The plant will operate through an independent agreement between the Northern Regional Center of the University of Honduras (CURLA) and African palm growers.

Honduras/Brazil:

The GOH offered the Brazilian government to back the establishment of a regional office of the Brazilian Enterprise of Agricultural Research (EMBRAPA). EMBRAPA's scientists are conducting research on producing ethanol from sugar cane. The GOH believes that an EMBRAPA office in Honduras offers the following attributes: Strategic geographic location, high potential for agriculture and forestry, extensive biodiversity ecosystems, Ethno cultural diversity, Mesoamerican cultural identity, air, sea, and land facility access, and human resources. Honduras offered 200 hectares at the CURLA campus, and 31 hectares for planting to create the "Regional Center for Innovation, Research, Training, and Technology Transfer in Sustainable Rural Development and Food Security." In addition, it offered the six agricultural and forestry universities, the three regional agricultural schools, and the ten technical agricultural schools to provide support for the regional office.